

# MOVEMENT AND MORTALITY OF BLACK DUCK, MOUNTAIN DUCK AND GREY TEAL BANDED IN SOUTH AUSTRALIA, 1953-1963

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## Summary

Movements shown by recoveries of Black Duck, Mountain Duck and Grey Teal banded at Yalkuri, Waltowa, Joanna, Merretti and Buckland's Park are discussed. It is shown that Grey Teal disperse widely in most directions. Black Duck and Mountain Duck populations appear to contain a proportion which move long distances but the majority of ducks of these two species are recovered near the banding site. Shooting provided most recoveries in each species and mortality and survival parameters have been calculated from return of bands from shot birds. Black Duck show a greater mortality, and consequently a lower expectancy of life, than Grey Teal but Mountain Duck are apparently subject to a lower shooting pressure, since the life expectancy is greatest in this species. Since ducks banded in South Australia do move into other states, it is obvious that conservation of waterfowl and their habitat is of continental concern.

## Introduction

Many Australian waterfowl are nomadic and in some species varying numbers of local populations may undertake random dispersal movements at various times (Frith, 1967). Such nomadism is apparently a response to variations in rainfall, which in turn affect water levels and food availability. Selection for a rigid migratory system, as prevails in many European and North American waterfowl, could lead to reduction in population levels in times of drought. In several Australian species of ducks there may be a regular movement involving a proportion of a population which otherwise disperses widely; other members may remain in a locality for many years (Frith, 1952, 1967).

Results of banding operations conducted on some duck species in South Australia have been reported (Frith, 1959, 1962, 1963, 1967). Data given below presents additional information obtained during banding operations conducted by, or for, the Victorian Fisheries and Wildlife Department and the South Australian Department of Fisheries and Fauna during the period 1953 to 1963. Attention has been paid only to results obtained by banding Black Duck (*Anas superciliosa* Gmelin), Mountain Duck (*Tudorna tudornoides* (Jardine and Selby)) and Grey Teal (*Anas gibberifrons* Müller), although small numbers of other waterfowl species were also banded.

## Methods

Irregular trapping for waterfowl was conducted at five sites in South Australia between

1953 and 1963. Birds were caught in wheat-baited traps of the type described by McNally and Falconer (1953) at Merretti Lake (near Renmark), at Yalkuri and Waltowa (on Lakes Alexandrina and Albert), at Buckland's Park (near Adelaide) and at Joanna (south of Naracoorte). More systematic trapping was conducted in 1961 and 1962 at Waltowa, Yalkuri and Merretti when the majority of birds were caught. Once caught, birds were banded but were generally released without details of sex and age being taken.

Data discussed below relate to recoveries (deaths) of these banded birds made to the end of 1969 and involves only those whose bands were returned. It should be noted that some bands were returned with incomplete information and such lack of detail accounts for the variations in totals given in the tables below.

Mortality rates and other survival parameters have been derived by methods discussed by Balham and Miers (1959), Bellrose and Chase (1950) and Reid (1966). In these calculations note has only been taken of birds known and reported to have been shot, since this sample is taken to represent the population in general. Variation in return of bands as a result of changes in shooting pressure is minimised by consideration of data encompassing several seasons. For the calculation of life expectancy, weighted mortality rates have been used to allow for variation in the strength of cohorts available for recovery (Farner, 1955).

During trapping sessions at Yalkuri in March 1961, samples of ducks trapped were

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fluoroscopically examined using a portable X-ray unit developed from models described by Elder (1955) and Bellrose (1959). The presence and number of shot pellets in these birds were noted.

### Results

#### i) BANDING TOTALS

Table 1 presents totals of Black Duck, Mountain Duck and Grey Teal banded and released at the various sites. Whilst other species were also caught, at each site Black Duck, Mountain Duck and Grey Teal predominated.

TABLE 1

*Banding of Black Duck, Mountain Duck and Grey Teal in South Australia, 1953-1963.*

Banding site	Black Duck	Mountain Duck	Grey Teal
Joanna	384	71	524
Yalkuri	1462	160	961
Merretti	149	130	273
Waltowa	1	690	104
Buckland's Park	45	nil	53
Total	2041	1051	1915

#### ii) RECOVERIES

Table 2 shows the numbers of Black Duck, Mountain Duck and Grey Teal reported as dead (recovered) up to the end of 1969, and the table also notes the method of recovery where known. In the three species under discussion, shooting provided the majority of recoveries.

Undoubtedly a proportion of recoveries reported merely as "found dead", or without further information being submitted, were also shot.

#### iii) DISPERSAL

Figure 1 shows the location of recoveries of Black Duck banded at Joanna, Yalkuri and Merretti. The small number of recoveries made of birds banded at Buckland's Park and Waltowa have been omitted. Generally dispersal from the more northern banding sites was towards the coastal regions or along the Murray valley but a large proportion of birds were found close to their banding sites. The majority of birds banded at Joanna was recovered locally; those which dispersed tended to travel eastwards into Victoria. Of six recoveries of Black Duck banded at Yalkuri during summer, five were shot in Lake Alexandrina, and of 67 recoveries of birds banded in summer and recovered in the first winter post-banding, 53 (79.1%) were in the Lake Alexandrina region. No birds banded at Joanna in summer were recovered at Lake Alexandrina up to the first winter following banding but later a few reached the area. Three birds banded at Joanna were eventually recovered in Tasmania and one in Queensland. Birds banded at Merretti (mostly in the November-December period) moved little but those banded at Yalkuri in the mid-March and early June period were recovered widely.

The locations of recovered Mountain Ducks are shown in Figure 2 and in this figure recoveries have been considered as two groups—those made of birds banded in the summer and recovered in their first summer and winter (direct recoveries, shown in insert map), and all recoveries made of any bird banded at any time (main map). Irregular trapping in the summer period of this and other species has restricted the number of direct recoveries involved. The direct recoveries shown in Figure 2 indicate the limited dispersal of birds during

TABLE 2

*Recovery methods of Black Duck, Mountain Duck and Grey Teal banded in South Australia.*

Recovery method	Black Duck		Mountain Duck		Grey Teal	
	No.	% of total	No.	% of total	No.	% of total
Shot	429	85.8	160	83.0	237	87.1
No information	60	12.0	28	14.4	19	7.0
Freshly dead	5	1.0	2	1.0	6	2.2
Trapped and killed	2	0.4	2	1.0	5	1.8
Hand-killed	2	0.4	nil	nil	4	1.5
Snared and killed	nil	nil	1	0.5	1	0.4
Netted and killed	2	0.4	nil	nil	nil	nil
Total banded	2041		1051		1915	
Total recovered	500	24.5	194	18.5	272	14.2

the first six months following summer banding. Of the recoveries of 25 birds banded at Waltowa during the summer, 17 (68%) were recovered in Lake Alexandrina up to the first winter post-banding, and of 44 recoveries of birds banded at Waltowa made in the first summer 34 (77.3%) were made in that area. Later movement occurs mainly along the Murray, and through the Coorong into western Victoria, particularly the Lake Corangamite region and beyond.

mortality in the first year post-banding was high, with more than 55% of Black Duck, 54% of Grey Teal and almost 44% of Mountain Duck recoveries being made within the year. Average mortality in the four years after banding is highest in Black Duck (53.9%), with Grey Teal (48.4%) and Mountain Duck (43.6%), having a greater survival rate. It is notable that Mountain Duck have a greater proportion (10.0%) surviving past the first four years post-banding. Average expectancy

TABLE 3

*Distances travelled by Black Duck, Mountain Duck and Grey Teal banded in South Australia.*

Distance in kilometers	Black Duck		Mountain Duck		Grey Teal	
	No.	% of total	No.	% of total	No.	% of total
0	6	1.3	1	0.6	4	1.5
1-100	314	67.5	94	57.3	98	37.7
101-200	46	9.9	10	6.1	33	12.7
201-300	48	10.3	26	15.9	35	13.5
301-400	21	4.5	13	8.0	37	14.2
401-500	13	2.8	15	9.1	27	10.4
501-1000	15	3.2	5	3.0	20	7.7
1000+	2	0.4	nil	nil	6	2.3
Total	465		164		260	

Movements undertaken by Grey Teal away from their banding site are shown in Figure 3. Comparison with the previous figures shows the more widespread dispersal undertaken by this species. Although there is a slight tendency for coastal movement, or at least coastal recoveries, no directional dispersal is noticeable for recoveries from any banding site. Long movements have occurred with two birds banded at Joanna being recovered in Queensland and one being shot at Tarblin, Western Australia, 36 months after banding.

Table 3 indicates the distance of recoveries of the three species from the banding sites: 78% of Black Duck, 64% of Mountain Duck and 53% of Grey Teal were recovered within 200 km (75 miles) of their banding sites.

#### iv) MORTALITY

The Black Duck apparently suffers a greater shooting pressure than the other species, with 21% of bands being returned from shot birds. Comparable figures for the Mountain Duck and Grey Teal are 15% and 12%. Table 4 presents mortality and survivorship data calculated from recoveries of shot birds for which dates of recovery are known. For all species

of life based on the shot sample is least in Black Duck with an expectancy of 1.36 years after banding as compared with 1.56 years for Grey Teal and 1.79 years for Mountain Duck.

#### v) X-RAY EXAMINATION

Table 5 presents the results of limited fluoroscopic examination of a series of Black Duck and Grey Teal made at Yalkuri in 1961. In this series more adult males of both species carried more shot than females, which in turn had a higher shot content than juvenile males. Overall, 11.0% of Black Duck carried shot as compared with 4.8% of Grey Teal. Of all birds carrying shot, 21.2% carried more than one pellet.

#### Discussion

Black Duck in South Australia are found on the deeper, permanent waters having ranker vegetation (Condon, 1962; Frith, 1967; Terrill and Rex, 1950). Recoveries have shown that most birds do not disperse in any one direction and most do not move widely at all (Fig. 1). There is however a proportion which disperse, generally to the east and south but some birds banded in the south move along the Murray and coastal regions north of Adelaide. Birds

TABLE 4

*Mortality and survival parameters based on recoveries of shot Black Duck, Mountain Duck, and Grey Teal banded in South Australia, 1953-1963, and recovered to the end of 1969.*

	0-1	1-2	Recoveries in years post-banding				6-
			2-3	3-4	4-5	5-6	
<b>BLACK DUCK</b>							
Total banded and available for recovery	2041	2041	2041	2041	2041	2041	1996
Total recovered	231	94	42	33	11	5	2
Percentage recovered	11.31	4.61	2.06	1.62	0.54	0.25	0.10
Mortality series	55.26	22.49	10.05	7.89	2.63	1.19	0.48
Cumulative recovery (%)	55.26	77.75	87.80	95.69	98.32	99.51	99.99
Survival series	44.74	22.25	12.20	4.31	1.68	0.48	0.01
Mortality rate	55.26	50.27	45.17	64.71	(average, in 0-4 year classes, = 53.85%)		
<b>MOUNTAIN DUCK</b>							
Total banded and available for recovery	1051	1051	1051	1051	1051	1051	1051
Total recovered	66	33	25	11	6	5	4
Percentage recovered	6.28	3.14	2.38	1.05	0.57	0.48	0.38
Mortality series	43.98	21.98	16.67	7.35	3.99	3.36	2.66
Cumulative recovery (%)	43.98	65.96	82.63	89.98	93.97	97.33	99.99
Survival series	56.02	34.04	17.37	10.02	6.03	2.67	0.01
Mortality rate	43.98	39.25	48.97	42.35	(average, 0-4 year classes = 43.64%)		
<b>GREY TEAL</b>							
Total banded and available for recovery	1915	1915	1915	1915	1915	1915	1862
Total recovered	128	42	32	18	7	5	4
Percentage recovered	6.68	2.19	1.67	0.94	0.37	0.26	0.22
Mortality series	54.18	17.76	13.54	7.62	3.00	2.11	1.79
Cumulative recovery (%)	54.18	71.94	85.48	93.10	96.10	98.21	100.00
Survival series	45.82	28.06	14.52	6.90	3.90	1.79	nil
Mortality rate	54.18	38.76	48.26	52.51	(average, 0-4 year classes, = 48.43%)		

banded in late autumn at Yalkuri showed the widest dispersal, in contrast to those banded at Merretti which moved little. Recovery data (Table 3, Fig. 1) agree with Frith's (1963, 1967) conclusion that only a proportion of any population are involved in dispersal, with members of various populations moving in any direction. However recoveries from these more southern banding sites have not shown a tendency for a regular northern movement in winter and a southerly summer movement as is apparent in birds banded in inland south-east Australia (Frith, 1963).

Condon (1962) considered that Mountain Duck inhabited the open grassy flats, swamps, lakes and rivers of South Australia. Frith (1967) found that, though the species preferred muddy shorelines of brackish waters, there was a dependence on fresh water and large congregations moved to Lakes Albert and Alexandrina to moult. Figure 2 clearly shows the importance of these freshwater lakes to this species (as also is the case with the Black Duck). Recoveries there presumably

refer to birds shot prior to or in the moulting period, since almost all dispersal up to the first winter post-banding is limited to Lakes Albert and Alexandrina, with much smaller numbers going to the Coorong. Some proportion of birds later disperse widely with an obvious concentration in the Lake Corangamite region of Victoria. It is possible that this too might be a moulting region.

Grey Teal are found widely in South Australia, on rivers, lakes, swamps and coastal estuaries or bays (Condon, 1962; Terrill and Rex, 1950). Though the Murray-Darling basin is the most important breeding area, coastal regions of south-east Australia provide the majority of refuge areas (Frith, 1962). The extensive and erratic movements of the species have already been discussed (Frith, 1962, 1963) and recoveries shown in Figure 3 confirm the more random movements undertaken by the Grey Teal. It has not been possible with the present data to examine the movements in this (and the other) species in relation to climatic variation.

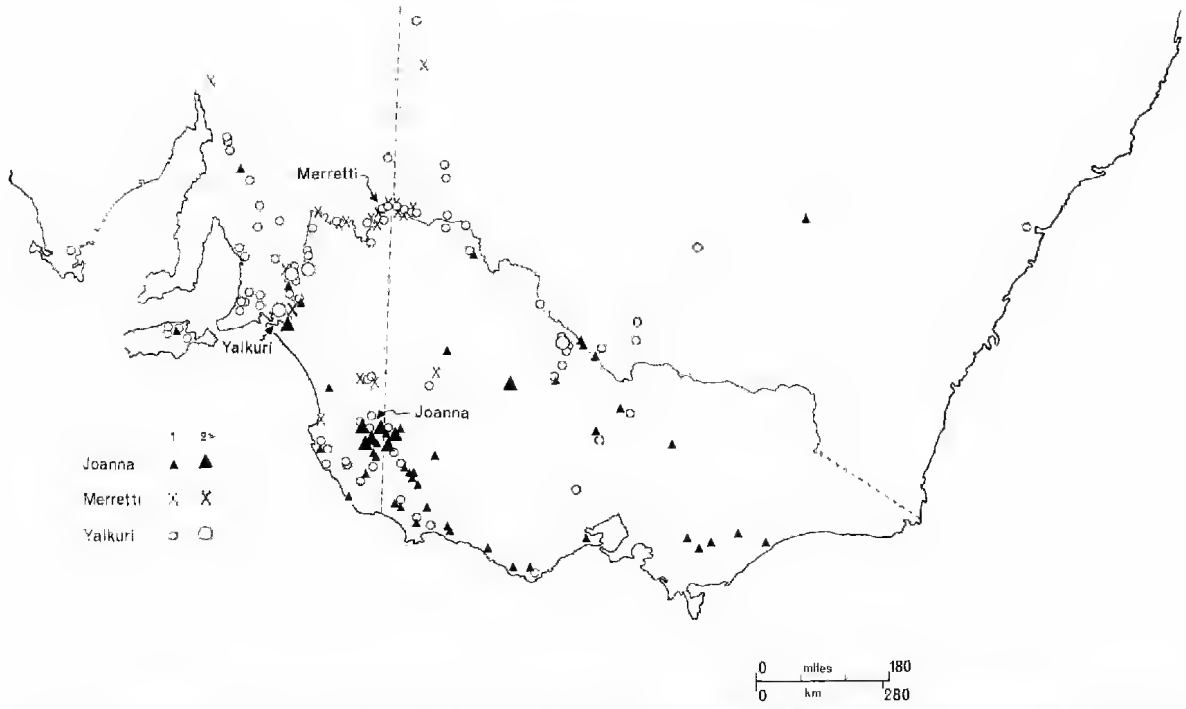


Fig. 1. Location of recoveries of Black Duck banded at Joanna, Merretti and Yalkuri between 1953 and 1963.

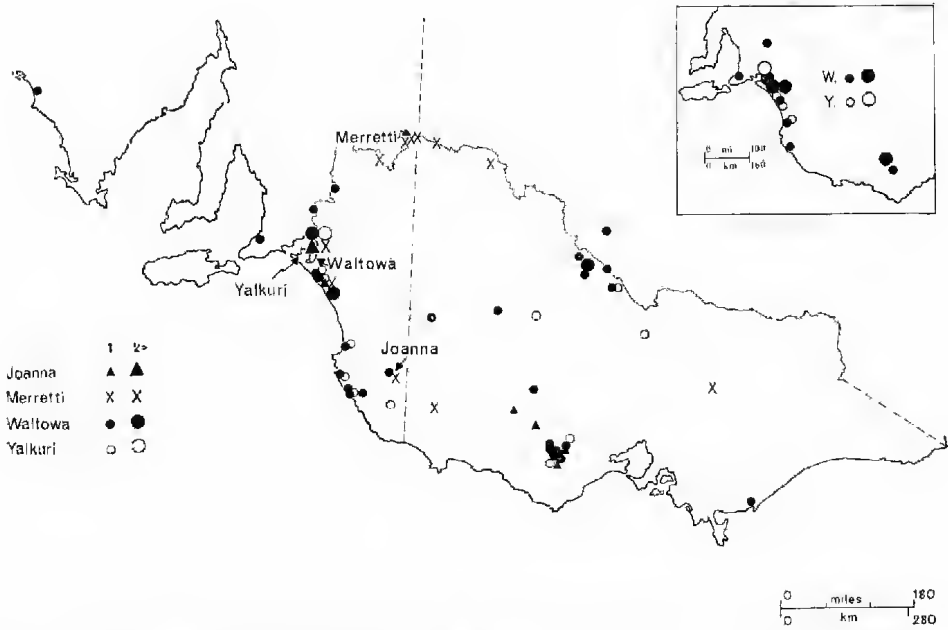


Fig. 2. Location of recoveries of Mountain Duck banded at Joanna, Merretti, Waltowa and Yalkuri between 1953 and 1963. Insert shows recoveries of birds banded in summer and recovered up to the first winter post-banding.

TABLE 5

*Fluoroscopic examination of Black Duck and Grey Teal caught at Yalkuri, South Australia, in March 1961.*

	Number examined			No. of pellets				
	without shot	with shot	percent with shot	1	2	3	4	5
<b>BLACK DUCK</b>								
Juvenile male	63	5	7.4	4	—	—	1	—
Adult male	86	14	14.0	13	—	1	—	—
All females	113	11	8.8	6	2	1	—	2
Unsexed/unaged	37	3	7.5	3	—	—	—	—
All ducks	299	33	11.0	26	2	2	1	2
<b>GREY TEAL</b>								
Juvenile male	83	3	3.6	3	—	—	—	—
Adult male	25	3	10.7	2	1	—	—	—
All females	122	7	5.4	5	2	—	—	—
All ducks	230	13	4.8	10	3	—	—	—

In contrast to results obtained by Frith (1963), Black Duck banded in southern South Australia suffered a higher mortality than Grey Teal and had consequently a lower life expectancy. Parameters recalculated from Frith's data according to Reid's (1966) methods show that Black Duck banded mainly in inland New South Wales had a mean mortality of 50% during the first four years of life and Grey Teal 52.4%. Comparable figures in this study are 53.9 and 48.4%. It

seems probable that Black Duck banded at Joanna, Yalkuri, Merretti and Waltowa (i.e. 97.8% of the total banded) moved less than those reported by Frith (1963) and thus were more prone to local shooting. Indeed the large proportion of Black Ducks carrying shot (Table 5) suggests that they are much more liable to be shot at than Grey Teal though they are of course a larger bird. Mountain Duck, though not considered a good game species (Frith, 1967), are clearly subject to

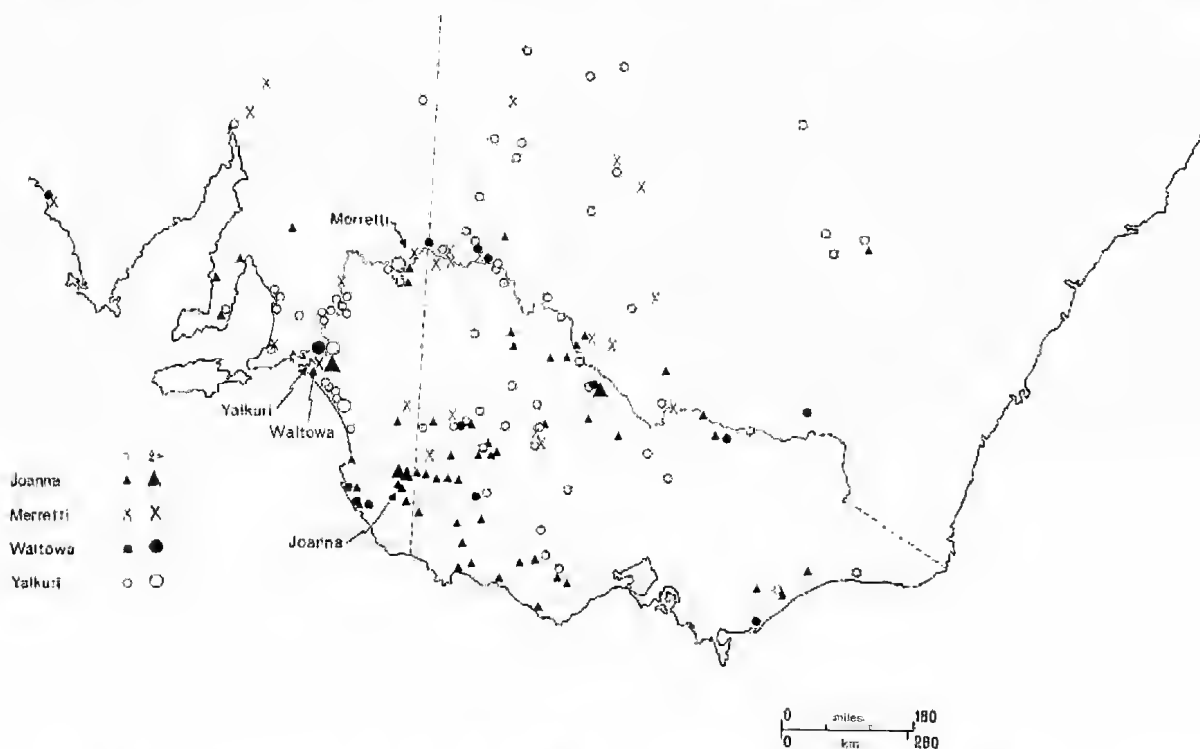


Fig. 3. Location of recoveries of Grey Teal banded at Joanna, Merretti, Waltowa and Yalkuri between 1953 and 1963.

considerable shooting pressure particularly in the Lakes Albert and Alexandrina region, the Coorong and western Victoria. However the lower mortality rate and greater expectancy of life post-banding suggests that this species is less attractive, and perhaps less available to shooters than Grey Teal or Black Duck. Nevertheless Tables 2 and 4 show that Mountain Duck have a higher overall band recovery than Grey Teal, a rate dependent mainly on shooting.

This study has shown the difference in mortality and movement of three species of waterfowl common in South Australia. Recoveries of banded birds have indicated that Grey Teal, which is essentially an inland breeding species, disperse more widely than Black Duck and Mountain Duck. The two latter species, though having some individuals which move long distances, have a higher local recovery rate than the Teal. Black Duck are most seden-

tary and are thus apparently more prone to local shooting pressures. Though the majority of recoveries of all species were returned from within the state, it is clear that other states, particularly Victoria, receive birds originating in South Australia. It is apparent that conservation of waterfowl and waterfowl habitat in one state will affect, at some stage, waterfowl inhabiting other states.

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